Unit 15
Day 4
Integer Roots

Fundamental theorem of Algebra:

Every polynomial of degree 1 or more has at least one complex zero (root).

$f(x) = x^2 + 2x + 3$

Number of zeros theorem:

A polynomial of degree **n** has at most **n** distinct zeros.

Find the integral roots (zeros, solutions):

1) $P(x)=x^3+3x^2-25x-75$

# of possible zeros: 3

possible integer zeros: $\pm1, \pm3, \pm5, \pm15, \pm75, \pm25$

find the roots:

	1	3	-25	-75
1	1	4	-21	-96
-1	1	2	-27	-48
3	1	6	-7	-96
-3	1	0	-25	0

$P(x)=(x+3)(x^2-25)$

$P(x)=(x+3)(x-5)(x+5)$

roots

-3, 5, -5

2) $x^4-11x^2-18x-8=0$

# of possible solutions: 4

possible integer solutions: $\pm 1, \pm 2, \pm 4, \pm 8$

find the roots:

$$
\begin{array}{r|rrrrr}
 & 1 & 0 & -11 & -18 & -8 \\
\hline
1 & 1 & 1 & -10 & -28 & -36 \\
-1 & 1 & -1 & -10 & -8 & 0
\end{array}
$$

$0=(x+1)(x^3-x^2-10x-8)$

$$
\begin{array}{r|rrrr}
 & 1 & -1 & -10 & -8 \\
\hline
-1 & 1 & -2 & -8 & 0
\end{array}
$$

$0=(x+1)(x+1)(x^2-2x-8)$

$0=(x+1)^2(x-4)(x+2)$

-1 (mult 2), 4, -2

3) $P(x)=x^3-7x^2+17x-15$

\# of possible roots: 3

possible integer roots: $\pm 1, \pm 3, \pm 5, \pm 15$

find the roots:

	1	−7	+17	−15
1	1	−6	11	−4
−1	1	−8	25	−40
3	1	−4	5	0

$3,\ 2\pm i$

$P(x)=(x-3)(x^2-4x+5)$

HW Wksht 1-8 all